KROHNE

achieve more

Move into the lead

Product overview flow measurement

Contents

Achieve more with KROHNE

KROHNE ranks among the world's leading companies involved in the development and production of innovative and reliable process measuring technology, providing solutions for all sectors around the globe. KROHNE was founded in 1921 in Duisburg, Germany. It has more than 2,700 employees and has a turnover of over 400 million euros. The company has 15 production facilities and owns 43 companies and joint ventures. In fact, KROHNE was the second company after VW to have a joint venture in Shanghai. Today, China is one of KROHNE's major markets. With an equity-to-assets ratio of approx. 42 %, the company is largely financially independent.

KROHNE is always a fair and reliable partner to its customers, business partners and employees. We provide our customers with optimal products and solutions which always meet or exceed their expectations in terms of quality, performance capability, service and design. Our customers are registered in diverse branches of industry such as chemicals, petrochemicals, water, wastewater, food, beverages, pharmaceuticals, oil and gas, power plants, pulp and paper etc.

The solution for every application

KROHNE has unique expertise when it comes to flow measurement. We hold over 1,000 patents relating to flow products and don't just demonstrate our ability with standard applications but also with applications that are demanding, requiring custom solutions. For us, customer orientation starts as early as research and development. Many of our products which are considered today's industrial standards, were developed in cooperation with our customers. Today, users around the world benefit from KROHNE innovation: Electromagnetic flowmeters with ceramic liners for highly corrosive media in chlorine chemistry. Mass flowmeters with just one straight tube – ideal for highly viscous media and low flow speeds. Ultrasonic flowmeters for custody transfer, working according to the time-of-flight method. Vortex measuring devices with integrated pressure and temperature compensation. And variable area flowmeters: they established KROHNE's business in 1921, today we can't imagine KROHNE without them, if a local display is to ensure the redundancy and the certainty of the system.

Due to their repeatability and accuracy, our flowmeters are installed as reference-meters on standard liquid flow calibration-rigs of national metrology institutes such as PTB (Germany), NMi/EuroLoop (the Netherlands) and NMiJ (Japan).

Online configurator

For detailed device selection, take advantage of our online platform Configure It. It's quick and easy to find the right product variant for you, to check the availability of the selected product or to request a non-binding quote.
For more information about Configure It go to **www.krohne-direct.com**

Product selection list

This table will help you in selecting the right measuring principle for your application

	Electro-magnetic flowmeters	Variable area flowmeters	Ultrasonic flowmeters	Mass-flowmeters	Vortex-flowmeters	Flow-controllers
	Page 8-17	Page 18-25	Page 26-33	Page 34-41	Page 42-47	Page 48-53
Liquids						
Liquids (e.g. water)	x	x	x	x	x	x
Low flow rates (<2 l/h)	x	x	–	x	–	–
High flow rates (>100000 m^3/h)	x	–	x	–	–	x
Non-conductive liquids	–	x	x	x	x	o
Viscous media	x	o	o	x	o	o
Gases						
Industrial gases	–	x	x	x	x	–
Low flow rates (<20 l/min)	–	x	o	x	–	–
High flow rates	–	o	x	x	x	–
Steam	–	o	x	o	x	–
Special applications						
Slurry, media with solids	x	–	–	o	–	–
Emulsions (oil/water)	o	x	o	x	o	o
Corrosive liquids (acids, alkalis)	x	x	x	x	o	o
Corrosive gas flows	–	o	o	o	o	–
Bi-directional measurements	x	–	x	x	–	o
Version						
2-wire	x	x	–	–	x	x
4-wire	x	–	x	x	–	–

x = suitable, o = suitable under certain conditions, – = not suitable

GDC concept: An electronics concept from which everybody benefits

IFC 300 C for electromagnetic flowmeters
MFC 300 C for mass flowmeters

IFC 300 F
MFC 300 F
UFC 300 F

IFC 300 W
MFC 300 W
UFC 300 W

IFC 300 R
MFC 300 R

IFC 100 C

IFC 100 W

User-friendliness is traditionally a top priority at KROHNE: whether during installation, commissioning, operation or communication – high-end technology only makes sense if it is simple and convenient for the customer to use.

That is why at KROHNE, user-friendliness begins with the electronics. Our development and application engineers have worked for years to develop a comprehensive design known as the General Device Concept – GDC for short.

What does it all mean? First of all, it features an uniform user interface to speed up the commissioning of the devices. Secondly, it boasts extensive device and process diagnostic functions, which can be exceeded by the Toolbox module. Thirdly, it's easy to integrate fieldbus interfaces such as PROFIBUS® and Foundation™ Fieldbus thanks to the high degree of modularity. And lastly, it's an electronics package that can be used in various housing shapes.

The IFC 300 electromagnetic converter is an electronics unit which is perfectly suited to all measuring tasks at the highest level of technology. The high-end device even masters the measurement of media with high solid content and flow measurement for rapidly changing media with certainty and ease. All inputs and outputs are electrically isolated from one another. It is not necessary to reparameterise the unit after replacing the converter.

KROHNE launched the little brother of the IFC 300 that is the IFC 100: an all-purpose device which boasts outstanding performance not only when it comes to measuring accuracy and diagnosis but also defines a new benchmark in terms of the price-performance ratio.

In the meantime, the ultrasonic and mass flowmeters also benefit from this GDC concept. And the largely identical electronics package featuring the same operating and connection package means you, the customer, also benefit.

Human Machine Interface (HMI): Simply clever, simply well thought-out

User-friendliness begins with selecting the right display and control elements.

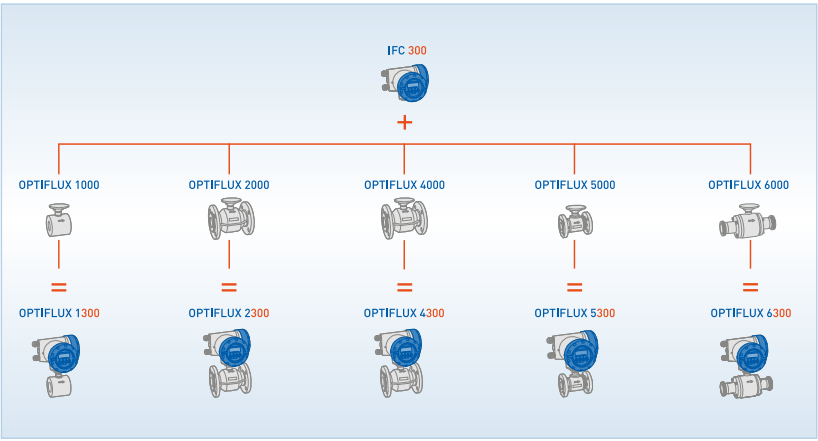
All devices feature a large, high-contrast display which makes it possible to display plain text information as well as graphic information such as the trend development of the flow.

Operation is simple and convenient thanks to a user-friendly interface with four optical buttons. Not only does it look good – it's also extremely practical. For example, the glass cover which protects the display from dirt and dust does not have to be removed during parameterization or operation.

Using the Quick Setup menu, the user can quickly adapt the OPTIFLUX to the application.

The converter can communicate with the user in many languages including German, English, French and Spanish.

Modular product lines: Many combinations for one customised solution



At KROHNE, we believe in the concept of modularity when it comes to offering our customers the measuring solution best suited to their process. Both our IFC and MFC converters can be freely combined with all devices in the OPTIFLUX and OPTIMASS lines. This modularity is also reflected in the names of the devices. For example, the OPTIFLUX 1300 is a combination of the OPTIFLUX 1000 sensor and the IFC 300 converter.

The modular product line

Converters

IFC 100 W
Wall-mounted

IFC 100 C
Standard applications

IFC 300 R
Rack-mounted

IFC 300 W
Wall-mounted

IFC 300 F
Field housing

IFC 300 C
General purpose

Flow sensors

OPTIFLUX 1000
The economic solution with standard functionality

OPTIFLUX 2000
The all-round solution for the water & wastewater industry

WATERFLUX 3000
The solution for measuring small and large flows without requiring inlets or outlets

OPTIFLUX 4000
The all-round solution for the process industry

OPTIFLUX 5000 sandwich
Ceramic measuring tube: maximum media and abrasion resistance and accuracy

OPTIFLUX 5000 flange
Ceramic measuring tube: maximum media and abrasion resistance and accuracy

OPTIFLUX 6000
The solution for the food and pharmaceutical industry

The specialists

OPTIFLUX 4040
2-wire device

OPTIFLUX 7300 sandwich
With non wetted capacitive electrodes and ceramic liner

OPTIFLUX 7300 flange
With non wetted capacitive electrodes and ceramic liner

TIDALFLUX 2300 F
For partially filled pipelines

WATERFLUX 3070
The solution for large turndown ratios and small spaces with no inlets or outlets

BATCHFLUX 5500
For volumetric filling systems in the beverage industry

Electromagnetic flowmeters

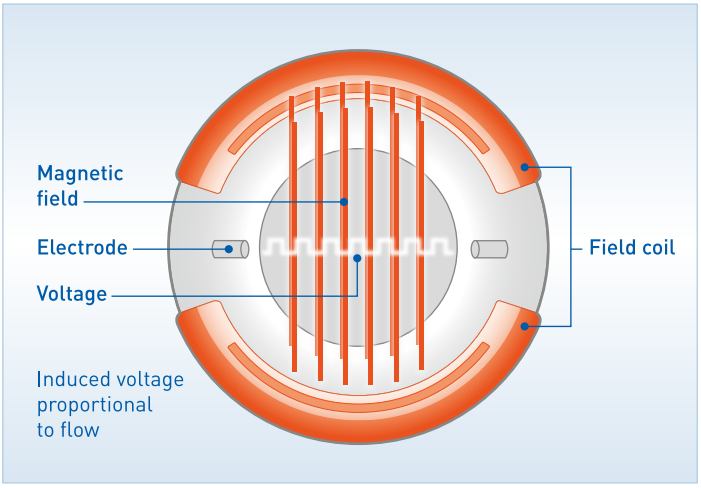
Highlights:

- One converter for all measuring tasks, leading to cost advantages when planning, purchasing, storing and training
- A wide range of sensors for every industry/ application
- The unique 3x100%-diagnostics (application and device diagnostic, out-of-spec testing) even exceeds the NAMUR requirements
- Virtual reference offers easy installation because grounding electrodes and expensive grounding rings are no longer necessary
- Reliable measurement, largely independent of the flow profile
- For the lowest conductivities
- Maximum application certainty, even with rapid media changes, pH jumps, high solids content and pulsating flow
- Every KROHNE electromagnetic flowmeter up to DN3000 is wet-calibrated in a direct comparison of volumes
- Wide choice of liner material for almost every application
- No obstruction in the flow, no pressure loss, no maintenance
- Large diameter range from DN2.5 up to 3000
- Excellent long-term stability
- Optimum zero-point stability regardless of changes in medium properties
- Minimal or no inlet/outlet runs
- Corrosion resitent liner thanks to high-performance ceramic

Electromagnetic flowmeters

The measuring principle

As early as 1832, Michael Faraday tried to determine the speed of the current in the Thames by measuring the voltage induced in flowing water by the earth's magnetic field. Electromagnetic flow measurement is based on Faraday's law of induction. According to this law, a voltage is induced when an electric conductive fluid flows through the magnetic field of an electromagnetic flowmeter. This voltage is proportional to the flow velocity of the medium.



The induced voltage is picked up either by two electrodes in contact with the medium or by capacitive electrodes with no contact to medium and supplied to a signal converter.

An signal converter transducer amplifies the signal and converts it into a standard signal (imposed current) and to a frequency/pulse signal (e.g. one pulse for every cubic meter of measured substance that flows through the measuring tube). The measuring tube is made out of electrically insulated material or lined with insulation on the inside so that the induced voltage is not shorted by the wall of the tube.

The standard for the competition: Electromagnetic flowmeters from KROHNE

Industries:

- Water and wastewater
- Chemical
- Food and beverage
- Pharmaceutical
- Power plants
- Pulp and paper
- Metal and mining

As founder and world market leader in electromagnetic flowmeter technology, we have been impressing our customers with innovation for more than 60 years, innovations that continue to set the standard for the competition. Our OPTIFLUX product line is an excellent example of this: a converter for all applications. A one-of-a-kind diagnostics package that can even look into the process. An intuitive operating concept featuring a quick start function for simple start-up.

Thanks to this unique combination of high-end technology and maximum user-friendliness, you will benefit in a wide range of industries: in the food and beverage industry, where fruit juices, milk and liquid hops must be mixed, dosed and filled under hygienic conditions. In the chemicals industry and in the pulp and paper industry, where our devices deal with acids, alkalis, pastes, sludges and other caustic media, or in the metal and mining industry where media with a high solid content are encountered on a daily basis (ore or excavator mud).

We produce electromagnetic flowmeters in our plants in the Netherlands, Brazil, India and China. It is no wonder that the Physikalisch-Technische Bundesanstalt (PTB) in Braunschweig, Germany, relies on electromagnetic flowmeters from KROHNE in their calibration systems.

OPTIFLUX 4300 in the filtration system in the Haltern waterworks, Germany

Production process of high-performance ceramics

Electromagnetic flow measurement: Increased safety through the use of high-performance ceramics in flange design

The converter is not the only critical factor in the reproducibility of the measured value during electromagnetic flow measurement. The form stability of the measuring tube under temperature and pressure stresses also plays an important role. To obtain a reliable measurement even with critical media, the measuring tube material, the electrode construction and the process connection must all be taken into account.

The challenge: The new measuring tube material should be highly resistant to caustic, corrosive and abrasive media and show off its superiority to conventional liners made of plastic such as PFA.

KROHNE accepted this challenge and, in close cooperation with FRIATEC AG from Mannheim, Germany, developed a high-performance ceramics for industrial use which can even withstand rapid temperature changes and high mechanical stresses.

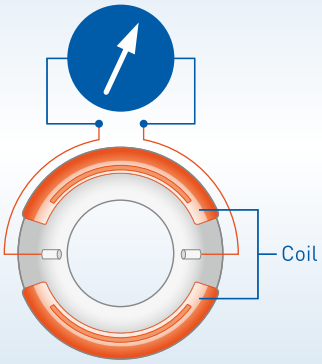
When it comes to measuring critical media such as those used in chlorine chemistry, it was also necessary to optimise the electrode construction. The result of these efforts? Using the so-called Cermet electrode has made it possible to develop a 100 % gap-free design. In doing so, the metal of the electrode combines with the material of the ceramic to form an insoluble compound when exposed to high temperatures.

In addition to the sandwiched version, our engineers also developed a flanged version. This version not only guarantees easy installation but also minimises the risk of leakage in case of a fire.

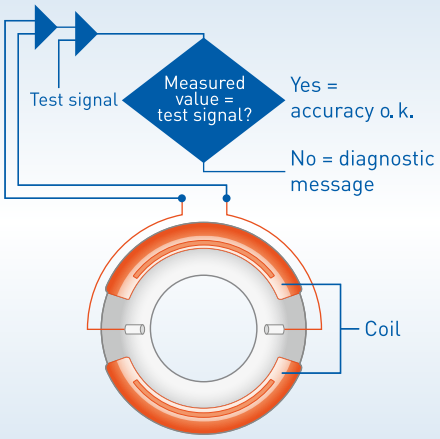
It is no wonder that the fields of application of the ceramic electromagnetic flowmeter are so numerous today. They range from measuring acids and alkalis in chemistry to usage in chlorine chemistry, to the volumetric filling of liquids in the beverage, pharmaceutical and cosmetics industries.

Electromagnetic flowmeters: 3x100%-diagnostics for maximum certainty

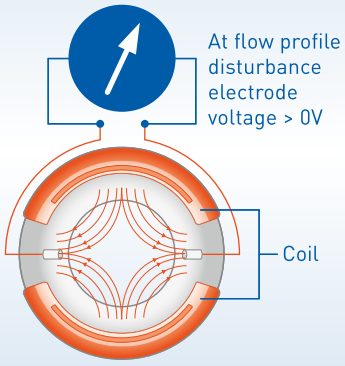
Resistance measurement
for detecting electrode covering, electrode short-circuit, excessively low conductivity and for measuring the conductivity and the coil temperature (media temperature)



Accuracy test
by means of a cyclically fed test signal



Magnetic field polarity reversal
for checking the flow profile and for detecting a partially filled measuring tube



KROHNE offers its customers complete application and process diagnostics as well as an accuracy and linearity test (out-of-spec diagnostics) in addition to the usual device diagnostics for the OPTIFLUX line.

With the indicators supplied by OPTIFLUX and knowledge of the process, the user can detect the following application problems with a high degree of certainty:

- Gas bubbles
- Electrode corrosion, deposits on electrodes
- Short-circuit
- Low conductivity
- Partial filling of measuring tube
- Liner damage
- External magnetic fields
- Disrupted flow profile

During the out-of-spec test, a determination is made, both online and cyclically, as to whether the device is still within its specifications. In particular, the accuracy is tested by feeding a test signal. The linearity of the device and the accuracy of the field current with which the magnetic field is generated are also checked.

Thanks to the 3x100%-diagnostics, the OPTIFLUX is much more than a simple flowmeter: it examines the process and provides the user with valuable information. In this respect, the OPTIFLUX even exceeds the requirements of VDI/VDE/NAMUR 2650.

The modular product line

	The economic solution with standard functionality for simple applications	The all-round solution for the water & wastewater industry	The solution for measuring small and large flows without requiring inlets or outlets
	OPTIFLUX 1100	**OPTIFLUX 2100**	**WATERFLUX 3100**
	 OPTIFLUX 1000 + IFC 100	 OPTIFLUX 2000 + IFC 100	 WATERFLUX 3000 + IFC 100
Measuring accuracy	±0.3% of measured value	±0.3% of measured value	±0.3% of measured value
Electrical conductivity	≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)	≥20 µS/cm
Process conditions	Solid content max. 3%	Solid content max. 3%	Clean drinking water
Outputs	Current, pulse, status	Current, pulse, status	Current, pulse, status
Power supply	100...230 VAC, 12...24 VDC, 24 VAC/DC	100...230 VAC, 12...24 VDC, 24 VAC/DC	100...230 VAC, 12...24 VDC, 24 VAC/DC
Protection category: Compact (C) Wall (W)	IP66, 67; NEMA4X, 6	IP66, 67; NEMA4X, 6	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6
	OPTIFLUX 1300	**OPTIFLUX 2300**	**WATERFLUX 3300**
	 OPTIFLUX 1000 + IFC 300	 OPTIFLUX 2000 + IFC 300	 WATERFLUX 3000 + IFC 300
Measuring accuracy	±0.3% of measured value	±0.2% of measured value	±0.2% of measured value
Electrical conductivity	≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)	≥20 µS/cm
Process conditions	Solid content max. 30%	Solid content max. 30%	Clean drinking water
Outputs	Current, pulse, status	Current, pulse, status	Current, pulse, status
Inputs	Binary	Binary	Binary
Communication	HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus
Power supply	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	100...230 VAC, 12...24 VDC, 24 VAC/DC
Protection category: Compact (C) Field (F) Wall (W) 19" Rack (R)	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1
Measuring sensor	**OPTIFLUX 1000**	**OPTIFLUX 2000**	**WATERFLUX 3000**
	 OPTIFLUX 1000	 OPTIFLUX 2000	 WATERFLUX 3000
Process connection EN 1092-1	DN10...150; PN16, 40	DN25...3000; PN2.5...40	DN25...300; PN 10, 16
Process connection ASME B16.5	3/8...6"; CL 150, 300	1...120"; CL 150, 300	1...12"; CL 150
Process temperature	-25...+120°C; -13...+248°F	-5...+90°C; +23...+194°F	-5...+70°C; +23...+158°F
Ambient temperature	-25...+65°C; -13...+149°F	-40...+65°C; -40...+149°F	-40...+65°C; -40...+149°F
Materials liner	PFA	Polypropylen, hard rubber, Polyolefin (PO)	DN25...300: Rilsan®, DN350...600: Rilsan® (pending)
Materials electrodes	Hastelloy®	Hastelloy®, titanium, stainless steel	Stainless steel 1.4301; AISI 304
Sensor	IP66, 67; NEMA4, 4X	IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P
Ex-Approvals	-	EEx, FM, CSA	-
Other approvals	FDA, MI-005, MI-001	KTW, WRAS, KIWA, ACS, OIML R49, MI-005, MI-001	ACS, DVGW, TZW/UBA, NSF, WRAS, OIML R49, MI-001

The all-round solution for the process industry	Ceramic measuring tube: maximum media and abrasion resistance and accuracy	Ceramic measuring tube: maximum media and abrasion resistance and accuracy	The solution for the food and pharmaceutical industry
OPTIFLUX 4100	**OPTIFLUX 5100 sandwich**	**OPTIFLUX 5100 flange**	**OPTIFLUX 6100**
 OPTIFLUX 4000 + IFC 100	 OPTIFLUX 5000 + IFC 100	 OPTIFLUX 5000 + IFC 100	 OPTIFLUX 6000 + IFC 100
±0.3% of measured value	±0.3% of measured value	±0.3% of measured value	±0.3% of measured value
≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)
Solid content max. 10%	Solid content max. 10%	Solid content max. 10%	Solid content max. 10%
Current, pulse, status	Current, pulse, status	Current, pulse, status	Current, pulse, status
100...230 VAC, 12...24 VDC, 24 VAC/DC	100...230 VAC, 12...24 VDC, 24 VAC/DC	100...230 VAC, 12...24 VDC, 24 VAC/DC	100...230 VAC, 12...24 VDC, 24 VAC/DC
IP66, 67; NEMA4X, 6	IP66, 67; NEMA4X, 6	IP66, 67; NEMA4X, 6	IP66, 67; NEMA4X, 6
OPTIFLUX 4300	**OPTIFLUX 5300 sandwich**	**OPTIFLUX 5300 flange**	**OPTIFLUX 6300**
 OPTIFLUX 4000 + IFC 300	 OPTIFLUX 5000 + IFC 300	 OPTIFLUX 5000 + IFC 300	 OPTIFLUX 6000 + IFC 300
±0.2% of measured value	±0.15% of measured value	±0.15% of measured value	±0.2% of measured value
≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)
Solid content max. 70%	Solid content max. 70%	Solid content max. 70%	Solid content max. 70%
Current, pulse, status	Current, pulse, status	Current, pulse, status	Current, pulse, status
Binary	Binary	Binary	Binary
HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus
85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC
IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1
OPTIFLUX 4000	**OPTIFLUX 5000 sandwich**	**OPTIFLUX 5000 flange**	**OPTIFLUX 6000**
 OPTIFLUX 4000	 OPTIFLUX 5000	 OPTIFLUX 5000	 OPTIFLUX 6000
DN2.5...2,000; PN6...40	DN2.5...100; PN16, 40	DN15...300; PN10, 16, 40	DN2.5...150; hygienic connections
1/10...80"; CL 150, 300, 600, 900, 1500	1/10...4"; CL 150, 300	1/2...12"; CL 150, 300	1/10...6"; hygienic connections
-40...+180°C; -40...+356°F	-40...+180°C; -76...+356°F	-40...+180°C; -76...+356°F	-40...+180°C; -40...+356°F
-40...+65°C; -40...+149°F	-40...+65°C; -40...+149°F	-40...+65°C; -40...+149°F	-40...+65°C; -40...+149°F
PFA, PTFE, ETFE and hard rubber, PU	Aluminium oxide, Zirconium oxide	Aluminium oxide, Zirconium oxide	PFA
Hastelloy®, titanium, tantalum, stainless steel, platinum, low noise	Cermet	Cermet ≤DN150/6", stainless steel, HC4, titanium, tantalum, platinum ≥DN150/6"	Hastelloy®, stainless steel, titanium, tantalum, platinum
IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P
EEx, FM, CSA	EEx, FM, CSA	EEx, FM, CSA	EEx, FM, CSA
FDA, OIML R49, R117, KIWA, MI-001, MI-005	FDA, MI-005	FDA, MI-005	FDA, 3A, EHEDG, MI-005

The specialists

	For partially filled pipelines	The solution for large turndown ratios and small spaces with no inlets or outlets
	TIDALFLUX 2300F	WATERFLUX 3070
		
Signal converter	**IFC 300 F**	**IFC 070**
Measuring accuracy	±1% of full scale	≤0.2% of measured value
Electrical conductivity	≥50 µS/cm (water ≥50 µS/cm)	>20 µS/cm
Process conditions	Solid content max. 70%	Clean water
Outputs	Current, pulse, status	Pulse, status
Inputs	Binary	-
Communication	HART®, Modbus	Datalogger/GSM (option)
Power supply	24, 115/120, 230/240 VAC	1 or 2 internal battery, external battery, up to 15 years battery lifetime
Protection category: Compact (C) **Field (F)**	IP67; NEMA4, 4X -	IP67, 68; NEMA4x, 6, 6P IP66, 67; NEMA4x, 6
Approvals	EEx zone 1	-
Measuring sensor	**TIDALFLUX 2000**	**WATERFLUX 3000**
Process connection		
EN 1092-1	DN200...1800; PN6, 10	DN25...300; PN10, 16
ASME B16.5	8...72"; CL 150, 300	1...12"; CL 150
Temperature range		
Process	-5...+60°C; +23...+140°F	-5...+70°C; +23...+158°F
Ambient	-40...+65°C; -40...+149°F	-40...+65°C; -40...+149°F
Materials		
Liner	Polyurethane	DN25...300: Rilsan®, DN350...600: Rilsan® (pending)
Electrodes	Hastelloy® C22, stainless steel	Stainless steel 1.4301; AISI 304
Protection category		
Measuring sensor	IP67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P
Approvals		
Ex (with signal converter)	EEx zone 1	-
Other approvals	-	ACS, DVGW, TZW/UBA, NSF, WRAS, OIML R49, MI-001

	2-wire device	With non wetted capacitive electrodes and ceramic line	For volumetric filling systems in the beverage industry
	OPTIFLUX 4040 C	**OPTIFLUX 7300 sandwich, flange**	**BATCHFLUX 5500**
			
Signal converter	**IFC 040**	**IFC300 C/CAP**	**IFC 500**
Measuring accuracy	±0.5% of measured value	± 0.5% of measured value ± 5 mm/s	±0.2% of measured value
Electrical conductivity	≥5 µS/cm (water ≥20 µS/cm)	0.05 µS/cm demineralised cold water ≥1 µS/cm	≥5 µS/cm (water ≥20 µS/cm)
Process conditions	Solid content max. 3%	Solid content max. 70%; gas content max. 5%	Water...milk
Outputs	Current	Current, pulse, status, frequency, limit switch	Frequency
Inputs	-	Control, current	-
Communication	HART®	HART®, FF, PA, DP, Modbus	-
Power supply	14...36 VDC	100...230 VAC, 24 VDC, 24 VAC/DC	24 VDC
Protection category: Compact (C) **Field (F)** **Wall (W)**	IP66, 67; NEMA4, 4X, 6 - -	IP66, 67; NEMA4, 4X, 6 - -	DN2.5, 4, 6, 25, 40: IP66, 67; NEMA4, 4X, 6; DN10, 15: IP69K; NEMA6P
	-	-	-
Measuring Sensor	**OPTIFLUX 4000**	**OPTIFLUX 7000**	**BATCHFLUX 5000**
Process connection			
EN 1092-1	DN10...150; PN16, 25, 40	DN25...80, 100; PN16, 40	DN2.5...40
ASME B16.5	3/8...6"; CL 150, 300	1...4"; 150 lb	1/10...1 1/2"
Temperature range			
Process	-25...+140°C; -13...+284°F	-40...+100°C; -40...+212°F	-20...+140°C; -4...+284°F
Ambient	-25...+60°C; -13...+140°F	-40...+65°C; -40...+149°F	+0...+60°C; +32...+140°F
Materials			
Liner	PTFE, PFA	Ceramic	Zirconium dioxide
Electrodes	Hastelloy®, platinum, stainless steel, tantalum, titanium	non wetted, capacitive	Cermet
Protection category			
Sensor	IP66, 67; NEMA4, 4X, 6	IP66, 67; NEMA4, 4X, 6	DN2.5, 4, 6, 25, 40: IP66, 67; NEMA4, 4X, 6; DN10, 15: IP69K; NEMA6P
Approvals			
Ex (with converter)	EEx, FM	ATEX	-
Other approvals	FDA	Conform FDA regulations	3A, FDA

Glass devices

DK46, 47, 48, 800
Small and compact dosing meters with valve

VA40
All-purpose flowmeter with various process connections

GA24
For maximum safety requirements

DK700
The cost-effective version for the analytical field

VA45
For measuring gases with low operating pressures

K20
The cost-effective plastic alternative

Metal devices

H250 M40
The new
standard device,
explosion proof and
intrinsically safe

H250 M9
The proven-in-use,
intrinsically safe
solution for the
process industry

H250 M8M
With space-saving
display

H250 M8E
With illuminated
display and
mA output

DK34
For vertical flows

DK37 M8M
Dosing meter
with large display

DK37 M8E
Dosing meter
with electronic signal output

DK32, 34
Dosing meter for high
pressures and rough
ambient conditions

Variable area flowmeters

Highlights:

- Reliable liquid and gas flow measurement, even without auxiliary energy
- High degree of application certainty, even with extremely small flow volumes
- Best price-performance ratio
- Minimal pressure losses
- Modular display and measuring transducer concept
- Excellent long-term stability
- Low maintenance
- Simple installation and start-up
- Approval in accordance with KTA 1401, RCC-E, RCC-M and NPT stamp

Variable area flowmeters

The measuring principle

Flowmeters based on the float principle generally consist of a vertical, conical measuring tube made out of glass, metal or plastic. Inside the tube there is a float whose shape depends on the application and which moves up and down freely. In most flowmeters, the medium to be measured flows from the bottom to the top and lifts the float in the process. At constant flow rates, the float position stabilizes where the lifting force acting on the float (A), the float form drag (W) and the float weight (G) are balanced.

With glass cones, the flow value can be read directly from a scale at the level of the float reading line. When it comes to metal cones, the height of the float is measured and displayed via a magnetic coupling system.

Diagram of VA40

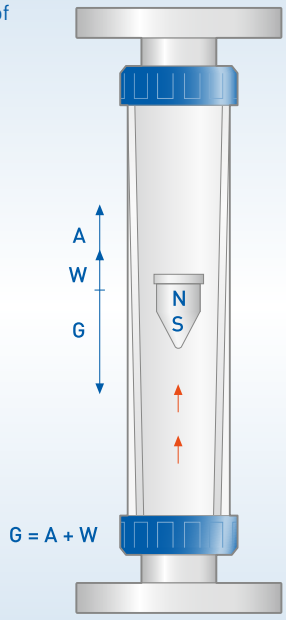
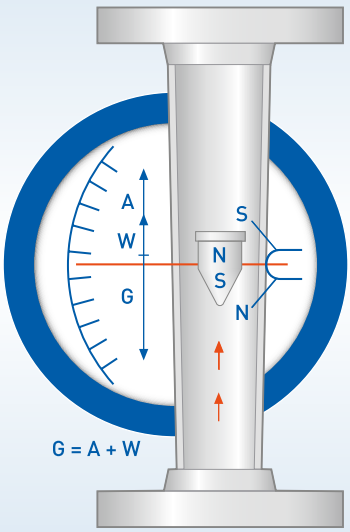


Diagram of H250 M40



Maximum reliability when measuring liquids and gases – Since 1921

Industries:

- Mechanical and plant engineering
- Water and wastewater
- Food and beverage
- Chemical
- Pharmaceutical
- Power plants
- Offshore plants
- Petrochemical

Since 1921, the name KROHNE has not only stood for innovative and reliable process measuring technology solutions, but also for exact, reliable and long-lasting variable area measuring technology.

Today, as the world's market leader, we cover a variety of applications with our comprehensive product portfolio of metal, glass and plastic cones.

The range of applications spans from hygienic and aseptic applications for the food industry, the pharmaceutical industry and medical technology, for which the world's only metal variable area flowmeter with EHEDG certification is used, right down to usage in the chemical and water industry or industrial forges and furnaces.

We can offer our customers particular expertise in safety-critical areas such as power plants. In such cases, our devices are put to the test in comprehensive test programs.

For over 30 years, KROHNE has been a reliable partner for nuclear power plant operators and system builders. In this field, KROHNE meets the requirements of KTA 1401, RCC-E, RCC-M and ASME Section III. This authorizes us to mark products with the N stamp and NPT stamp.

Measuring the flow of CO_2 in the inlet lines of the storage tanks at Eckes-Granini, Germany

Metal devices

	With space-saving display	With illuminated display and mA output	The proven-in-use, intrinsically safe solution for the process industry	The new standard device, explosion proof and intrinsically safe
	H250 M8M	**H250 M8E**	**H250 M9**	**H250 M40**
				
Measuring accuracy (VDI/VDE 3513-2)	1.6%	1.6%	1.6%	1.6%
Outputs	-	4...20 mA	4...20 mA	4...20 mA
Limit switches	2	via HART®	2	2
Totalizer	-	via HART®	6 digit	8 digit, pulse output
Communication	-	HART®	HART®, PA	HART®, FF, PA
Power supply	-	14.8...30 VDC, (2-wire)	12...30 VDC, (2-wire)	14...30 VDC, (2-wire)
Protection category	IP65	IP65	IP65, 67; NEMA4, 4X, 6	IP66, 68; NEMA4, 4X, 6
Process connections				
EN 1092-1	DN15...150	DN15...150	DN15...150	DN15...150
ASME B16.5	1/2...6"	1/2...6"	1/2...6"	1/2...6"
Threaded	1/2...2" NPT, G1/2...G2	1/2...2" NPT, G1/2...G2	1/2...2" NPT, G1/2...G2	1/2...2" NPT, G1/2...G2
Special	Clamp, aseptic	Clamp, aseptic	Clamp, aseptic	Clamp, aseptic
Pressure ratings				
EN 1092-1	PN16, 40, 63, 100, 160, 250*	PN16, 40, 63, 100, 160, 250*	PN16, 40, 63, 100, 160, 250*	PN16, 40, 63, 100, 160, 250*
ASME B16.5	CL 150, 300, 600, 900, 1500*	CL 150, 300, 600, 900, 1500*	CL 150, 300, 600, 900, 1500*	CL 150, 300, 600, 900, 1500*
Process pressure	0...400 bar; 0...5802 psi, optional to 3000 bar; 43511 psi	0...400 bar; 0...5802 psi, optional to 3000 bar; 43511 psi	0...400 bar; 0...5802 psi, optional to 3000 bar; 43511 psi	0...400 bar; 0...5802 psi, optional to 3000 bar; 43511 psi
Measuring ranges				
Water	10...120000 l/h	10...120000 l/h	10...120000 l/h	10...120000 l/h
Air	0.7...2800 m^3/h	0.7...2800 m^3/h	0.7...2800 m^3/h	0.7...2800 m^3/h
Temperature ranges				
Process	-80...+200°C; -112...+362°F	-25...+200°C; -13...+362°F	-200...+300°C; -328...+572°F	-200...+300°C; -328...+572°F
Ambient non-Ex	-40...+70°C; -40...+128°F	-20...+70°C; -4...+128°F	-40...+120°C; -40...+248°F	-40...+120°C; -40...+248°F
Ambient Ex	-40...+60°C; -40...+140°F	-20...+60°C; -4...+140°F	-40...+60°C; -40...+140°F	-40...+60°C; -40...+140°F
Materials				
Wetted parts	Stainless steel, Hastelloy®, titanium, Monel®, ceramic, PTFE	Stainless steel, Hastelloy®, titanium, Monel®, ceramic, PTFE	Stainless steel, Hastelloy®, titanium, Monel®, ceramic, PTFE	Stainless steel, Hastelloy®, titanium, Monel®, ceramic, PTFE
Display	PPS	PPS	Die cast aluminium, polyurethane coating or stainless steel	Die cast aluminium, polyurethane coating or stainless steel
Approvals				
Ex	ATEX, NEPSI	ATEX, NEPSI	ATEX, NEPSI, FM	ATEX, IEC-EX, FM, FM-C, NEPSI
Hygiene	EHEDG	EHEDG	EHEDG	EHEDG

	Dosing meter for high pressures and rough ambient conditions	Dosing meter with large display	Dosing meter with electronic signal output
	DK32, 34	DK37 M8M	DK37 M8E
			
Measuring accuracy (VDI/VDE 3513)	4.0%	2.5%	2.5%
Outputs	-	-	4...20 mA
Limit switches	2	2	via HART®
Totalizer	-	-	via HART®
Communication	-	-	HART®
Power supply	-	-	14.8...30 VDC
Protection category	IP65	IP65	IP65
Process connections			
Connections	1/4" NPT, 1/2" NPT, G1/4, cutting clamp, clamping ring, hose connections*	1/4" NPT, 1/2" NPT, G1/4, cutting clamp, clamping ring, hose connections*	1/4" NPT, 1/2" NPT, G1/4, cutting clamp, clamping ring, hose connections*
Flange adapter	DN15, 25; 1/2" 1"	DN15, 25; 1/2", 1"	DN15, 25; 1/2", 1"
Pressure ratings			
EN 1092-1	PN40*	PN40*	PN40*
ASME B16.5	CL 150, 300*	CL 150, 300*	CL 150, 300*
Process pressure	130 bar; 1885 psi optional to 500 bar; 7251 psi	130 bar; 1885 psi optional to 500 bar; 7251 psi	130 bar; 1885 psi optional to 500 bar; 7251 psi
Measuring ranges			
Water	3...150 l/h	3...150 l/h	3...150 l/h
Air	16...4800 l/h	16...4800 l/h	16...4800 l/h
Temperature ranges			
Process	-80...+150°C; -112...+302°F	-40...+150°C; -40...+302°F	-25...+135°C; -13...+275°F
Ambient non-Ex	-20...+70°C; -4...+128°F	-40...+70°C; -40...+128°F	-20...+70°C; -4...+128°F
Ambient Ex	-20...+60°C; -4...+140°F	-40...+60°C; -40...+140°F	-20...+60°C; -4...+140°F
Materials			
Wetted parts	Stainless steel, titanium, Monel®, Hastelloy®	Stainless steel, titanium, Monel®, Hastelloy®	Stainless steel, titanium, Monel®, Hastelloy®
Display	Die-cast aluminium, polyurethane coating	PPS	PPS
Approvals			
Ex	ATEX, NEPSI	ATEX, NEPSI	ATEX, NEPSI
Hygiene	-	-	-

*others on request

Glass devices

	Small and compact dosing meters with valve	The cost-effective version for the analytical field	All-purpose flowmeter with various process connections
	DK46, 47, 48, 800	DK700	VA40
			
Measuring accuracy (VDI/VDE 3513)	1.0%; 2.5%; 4.0%	4.0%; 6.0%	1.0%
Outputs	-	-	-
Limit switches	2	-	2
Totalizer	-	-	-
Communication	-	-	-
Power supply	-	-	-
Protection category	-	-	-
Process connection			
Connections	1/4" NPT, G1/4, cutting clamp, clamping ring, hose connections*	G1/8, hose connections	Threaded, flange, hose connectoions, hygienic design
Pressure ratings			
EN 1092-1	-	-	PN40
ASME B16.5	-	-	CL 150
Process pressure	4...10 bar; 58...145 psi	1...4 bar; 14.5...58 psi	7...10 bar; 102...145 psi
Measuring ranges			
Water	0.4...160 l/h	0.25...40 l/h	0.4...10000 l/h
Air	0.5...5000 l/h	0.5...1000 l/h	0.007...310 m^3/h
Temperature ranges			
Process	-5...+100°C; -23...+212°F	-5...+100°C; -23...+212°F	-20...+100°C; -4...+212°F
Ambient non-Ex	-20...+100°C; -4...+212°F	-20...+100°C; -4...+212°F	-20...+100°C; -4...+212°F
Ambient Ex	-20...+70°C; -4...+128°F		-20...+85°C; -4...+185°F
Materials			
Measuring cone	Borosilicate glass	Borosilicate glass	Borosilicate glass
Process connection	Stainless steel, brass, PVDF	PVDF	Stainless steel, PVDF
Approvals			
Ex	ATEX	-	ATEX
Hygiene	-	-	-

*others on request

	For measuring gases with low operating pressures	For maximum safety requirements	The cost-effective plastic alternative
	VA45	GA24	K20
			
Measuring accuracy (VDI/VDE 3513)	2.5%	1.0%	±2.5% full scale
Outputs	-	-	-
Limit switches	-	2	-
Totalizer	-	-	-
Communication	-	-	-
Power supply	-	-	-
Protection category	-	-	-
Process connection			
Connections	Threaded, flange, hose connections	Flange DN15...50; ASME1/2...2"	Threaded G1/2...2
Pressure ratings			
EN 1092-1	-	PN40	-
ASME B16.5	-	CL 150	-
Process pressure	1 bar; 14.5 psi	7...10 bar; 102...145 psi	2...12 bar; 29...174 psi
Measuring ranges			
Water	-	0.4...10000 l/h	0.65...25000 l/h
Air	150...60000 l/h	0.007...310 m^3/h	-
Temperature ranges			
Process	-20...+100°C; -4...+212°F	-40...+120°C; -40...+248°F	-20...+100°C; -4...+212°F
Ambient non-Ex	-20...+100°C; -4...+212°F	-20...+100°C; -4...+212°F	-20...+100°C; -4...+212°F
Ambient Ex	-	-	-
Materials			
Measuring cone	Borosilicate glass	Borosilicate glass	Polysulphone
Process connection	Stainless steel	Steel plate galvanised and coated	Polysulphone
Approvals			
Ex	-	ATEX	-
Hygiene	-	-	-

Process measuring technology

OPTISONIC 7300
Universal 2-beam device for inline measurement of process gases

UFM 3030
Universal 3-beam device for inline measurement of liquids

UFM 530 HT
Rugged 2-beam high-temperature device for extreme process conditions

OPTISONIC 6300
Flexible clamp-on device with industrial clamp-on mechanism

OPTISONIC 6400
Battery-powered portable clamp-on device

Custody transfer

ALTOSONIC III
Cost-effective 3-beam device to measure light products for custody transfer

ALTOSONIC V12
12-beam device for measuring gas for custody transfer

ALTOSONIC V
5-beam device for measuring crude oil and crude oil products for custody transfer

Ultrasonic flowmeters

UFC 300 W

User-friendliness redefined

Ultrasonic clamp-on flowmeters: no training, no special tools, no open issues

Whether it's installation, commissioning, calibration or maintenance, KROHNE is the first manufacturer of ultrasonic clamp-on flowmeters to comprehensively deal with and redefine the topic of user-friendliness.

For the OPTISONIC 6300 ultrasonic flowmeter, for example, it takes just 15 minutes from installation to complete commissioning of the device.

This is due not only to the simple installation using patented clamping devices requiring no special tools but also to the signal measuring transducers pre-installed on the rail at the factory.

And commissioning the OPTISONIC 6300 is as simple as it is safe. After being switched on for the first time, the electronic unit carries out an automatic self test. The preset parameters cover 90 % of all applications.

An intelligent installation assistant now guides the user step by step through the program – and simultaneously provides support during optimisation of the flow measurement.

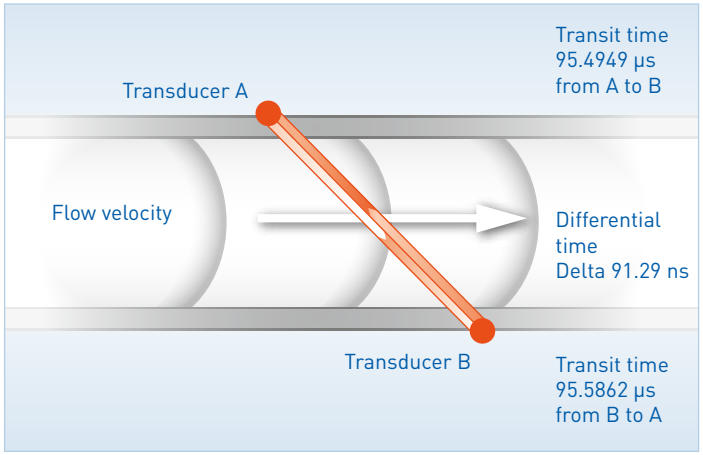
Ultrasonic flowmeters

Highlights:

- Maximum accuracy and reproducibility regardless of media properties such as viscosity, temperature, density and electrical conductivity
- No moving parts or components that protrude into the measuring tube
- Low operating costs due to non-wearing parts and maintenance-free status
- Excellent long-term stability, no recalibration
- High degree of reliability thanks to several redundant measuring paths

The measuring principle

KROHNE ultrasonic flowmeters are based on the time-of-flight method. This method consists of two diagonally opposed ultrasonic sensors which function alternately as transmitters and receivers. The sound signal alternately emitted from both is at once accelerated by the flow and slowed down against the flow. The difference in the time the signal requires to travel the measured sections is directly proportional to the mean flow rate from which the volumetric flow can then be calculated. Through the use of several ultrasonic paths, flow profile aberrations can be compensated.



Standard in the process industry: Benchmark for custody transfer

Whether liquid or gaseous, aggressive or corrosive: KROHNE ultrasonic flowmeters measure a wide range of media.

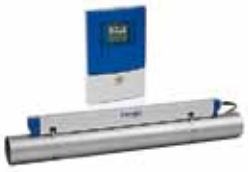
In 1997, KROHNE introduced the ALTOSONIC V, the first high precision, calibratable ultrasonic flowmeter for the petroleum industry. The ALTOSONIC V's five measuring paths can perform extremely precise and reproducible measurements regardless of the viscosity of the medium – a real quantum leap.

As the world's leader in the field of ultrasonic inline flowmeters, our devices are at home in a wide range of industries. Whether it's measuring cooling water and demineralized water in power plants, controlling dosing and mixing processes in the chemical industry or measuring liquid hydrocarbons in the oil and gas industry, you can put your absolute trust in KROHNE ultrasonic flowmeters in any situation.

Industries:

- Oil and gas
- Petrochemical
- Chemical
- Cold and hot water
- Heating, Ventilation & Air Conditioning (HVAC)
- Power plants
- Semi-conductors

Process measuring technology

	Flexible clamp-on device with clamping mechanism suitable for industry	Battery-powered portable clamp-on device	Universal 3-beam device for inline measurement of liquids	Rugged 2-beam high-temperature device for extreme process conditions
	OPTISONIC 6300	**OPTISONIC 6400**	**UFM 3030**	**UFM 530 HT**
				
Signal converter	**UFC 300**	**UFC 400**	**UFC 030**	**UFC 030**
Measuring accuracy	±1.0% of measured value	±1.0% of measured value	±0.5% of measured value	±1.0% of measured value
Process conditions	Liquids with max. 5% solid content and max. 2% gas content	Liquids with max. 5% solid content and max. 2% gas content	Liquids with max. 5% solid content and max. 2% gas content	Liquids with max. 5% solid content and max. 1% gas content
Outputs	Current, pulse, status	Current, pulse, status	Current, pulse, status	Current, pulse, status
Inputs	Binary	2 x 0(4)...20 mA	Binary, mA (temp., pressure)	Binary, mA (temp., pressure)
Communication	HART®	USB slave, HART®	HART®, Profibus PA	HART®, Profibus PA
Power supply	85...250 VAC; 20.5...26 VAC/DC	Battery power	100...240 VAC; 24 VAC/DC	100...240 VAC; 24 VAC/DC
Protection category: Compact (C) Field (F) Wall (W)	- IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X	- IP65 -	IP67; NEMA6 IP65; NEMA4, 4X -	- IP65, NEMA4, 4X -
Measuring sensor	**OPTISONIC 6000**	**OPTISONIC 6000**	**UFS 3000**	**UFS 500 HT**
Process connection				
EN 1092-1	DN15...4000	DN15...4000	DN25...3000; PN10...100	DN25...80, 100...150, 200...300; PN10, 16, 40
ASME B16.5	1/2...160"	1/2...160"	1...120"; CL 150...1500	1...12"; CL 150
Temperature range				
Process	-40...+200°C; -40...+392°F	-40...+200°C; -40...+392°F	-25...+220°C; -13...+428°F	-25...+500°C; -274...+932°F
Ambient (incl. converter)	-40...+60°C; -40...+140°F	-20...+55°C; -4...+131°F	-40...+65°C; -13...+149°F	-40...+65°C; -13...+149°F
Materials				
Measuring tube, flange	Sensor in aluminium, stainless steel	Sensor in aluminum	Steel, stainless steel, Hastelloy® C4, duplex	Stainless steel, steel, duplex, Inconel®
Protection category				
Measuring sensor	IP67; NEMA6	IP67; NEMA6	IP65, 67, 68; NEMA4, 4X, 6, 6P	IP65; NEMA4, 4X
Approvals				
Ex	ATEX, FM, CSA, NEPSI	-	ATEX, FM, CSA, NEPSI	ATEX, FM, CSA
Custody transfer	-	-	EN 1434, MID MI-004	-

Custody transfer

Universal 2-beam device for inline measurement of process gases	12-beam device for measurement of gases for custody transfer	Cost-effective 3-beam device to measure light products for custody transfer	5-beam device for measurement of petroleum and petroleum products for custody transfer
OPTISONIC 7300	**ALTOSONIC V12**	**ALTOSONIC III**	**ALTOSONIC V**
			
GFC 300	**GFC V12**	**UFC III**	**UFC-V / UFP-V**
Air calibration (atmospheric): 2...3": ±2%; 4...24": ±1%	±0.2% of measured value, ±0.1% following linearization through flow computer	±0.2% of measured value for 20.000<RE<50.000, 0.15% of measured value for RE>50.000	±0.15% of measured value, turndown ratio 1:10; ±0.20% of measured value, turndown ratio 1:50
Process gases	Natural gas	Single-hydrocarbons	Multi-hydrocarbons, viscosity 0.1...1500 cSt
Current, pulse, status	4 x digital	Current, pulse, status	4 x digital, 1 x analogue
2 x 4...20 mA, active, binary	Binary	-	6 x digital, 16 x analogue
HART®, Modbus (Profibus, FF pending)	Modbus 2 x RS485	-	Modbus RS422/485
85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	24 VDC	100...240 VAC; 24 VAC/DC	100...240 VAC; 24 VAC/DC
IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X	IP66 - -	IP67; NEMA6 - -	IP65, 67; NEMA4, 6 - -
OPTISONIC 7000	**ALTOSONIC V12**	**ALTOSONIC III**	**ALTOSONIC V**
DN50...600; PN10, 16, 40	-	-	-
2...24"; CL 150...900	4...64"; Cl 150...2500	2...40"; CL 150...1500	4...40"; CL 150...1500
-40...+180°C; -40...+356°F	-40...+100°C; -40...+212°F	-200...+250°C; -328...+428°F	-200...+250°C; -328...+428°F
-40...+65°C; -40...+149°F	-40...+65°C; -40...+150°F	-40...+70°C; -13...+149°F	-55...+60°C; -67...+140°F
Steel, stainless steel, Hastelloy® C, duplex	LT carbon steel, stainless steel + duplex optional	Stainless steel	Steel, stainless steel, Hastelloy® C4, duplex
IP67; NEMA6	IP66	IP67; NEMA6	IP65, 67; NEMA4, 6
ATEX; pending: FM, CSA, NEPSI	ATEX, FM, CSA, IECEx	ATEX, FM, CSA, IECEx	ATEX, FM, CSA, IECEx
-	OIML R137, MID, AGA 9, ISO 17089	MID MI-005, Gosstandard, OIML R-117-1 class 0.3	MID MI-005, Gosstandard, OIML R-117-1 class 0.3

The modular product line

Converters

MFC 300 R
Rack-mounted

MFC 300 W/MFC 400 W
Wall-mounted

MFC 300 F/MFC 400 F
Field housing

MFC 300 C/MFC 400 C
General purpose

Flow sensors

OPTIMASS 1000
The standard device with an
excellent price-performance ratio

OPTIMASS 2000
The first choice for bulk flows
for custody transfer

OPTIMASS 3000
Suitable for extremely low
flow rates

OPTIMASS 7000
High-end solution featuring a
single straight measuring tube

OPTIMASS 6000
The standard high-performance meter
for the process industry

The specialists

OPTIGAS 4010/5010
Specially designed for CNG and
LPG in dispensing systems

OPTIBATCH 4011
Specially designed for linear
and rotating filling machines

Mass flowmeters

Mass flowmeters: A solution for virtually all process applications

When it comes to selecting a flowmeter for your application, the OPTIMASS range covers all bases. Our engineers have developed a family of meters from small to large, for high pressure, cryogenic temperatures and high temperatures.

All meters have been designed to reduce constraints on the user with regards to installation – simply follow good engineering practise to obtain the desired results. Another highlight is definitely the diagnostics platform, which is unique in this class of device. It not only monitors the device itself but also the process and the process environment.

Within the system, the diagnostics software monitors such things as the process temperature and a series of auxiliary values such as the driver unit power, in order to ultimately confirm the condition of the process medium. The OPTIMASS can even generate warning messages when a certain proportion of gas bubbles or solids is exceeded, providing valuable information about the process itself.


+1.803

Highlights:

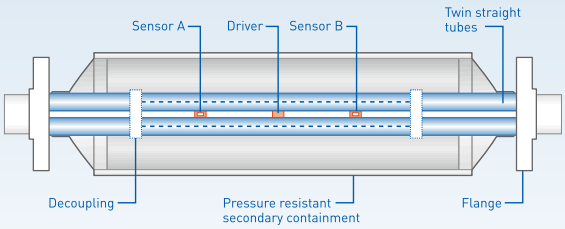
- Measurement of mass flow, density and temperature as well as calculation of volume flow and mass or volume concentration with a single device
- Complete line of measurement devices to cover almost every application
- Not susceptible to effects of installation: Can be installed regardless of type of installation and external influences such as tube vibrations
- OPTIMASS 6400 is the standard high-performance meter for the process industry
- OPTIMASS 7000 is the only straight tube measuring device for use when custody transfer is required in the highest OIML accuracy class of 0.3
- Reliable measurement even for problematic applications such as highly viscous media, inhomogeneous mixtures, media with solid content or gas inclusions
- From 0.00015 to 2300 t/h flow
- Wide temperature range from -200 °C/-328 °F to +400 °C/+752 °F
- Pressure-resistant jacket up to 150 bar; 1450 psi
- Easily drained and easy to clean
- Patented Adaptive Sensor Technology (AST) for maximum reliability in measuring results
- Minimal pressure loss with straight tube measuring devices = low power consumption
- OPTIMASS 7000 for highly sensitive media as well as media with low flow velocity
- Rapid signal processing even with media and temperature changes and sudden changes in density
- Superior density accuracy, even during rapid changes in temperature; excellent zero-point stability
- OPTIMASS 2000 with integrated pressure compensation for measuring bulk flow rates
- OPTIBATCH – ideal for linear and rotating filling machines

Mass flowmeters

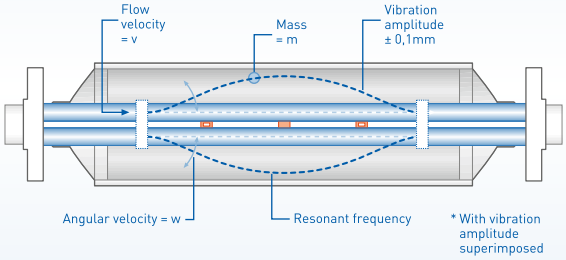
The measuring principle

The function of mass flowmeters is based on the Coriolis principle. The mass flow rate of liquids and gases can be calculated from the deformation of the measuring tube caused by the flow. The media density can also be derived from the resonance frequency of the oscillating tube. Two sensor coils are used to calculate the Coriolis effect. If there is no flow, both sensors record the same sinusoidal signal. Once a flow begins, the Coriolis force acts on the flowing mass particles of the medium and causes the measuring tube to deform, resulting in a phase shift between the sensor signals. The sensors measure the phase shift of the sinusoidal vibrations. This phase shift is directly proportional to the mass flow.

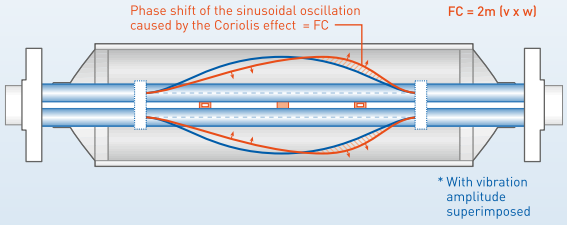
Diagram of OPTIMASS 1000



Sympathetic vibration without flow*



Phase shift with flow*



Superior performance – Even with quick temperature and media changes

Just how accurate and reliable a mass flowmeter actually is becomes obvious when constant parameters such as medium, temperature or density undergo sudden changes. The OPTIMASS series from KROHNE sets the standard. With high performing meters what ever the design.

KROHNE offers superior straight and bent tube design mass flowmeters, so the customer now can choose the best meter for his application. We offer a uniquely straight tube design for minimal pressure drop, high viscous and slurry applications. The superior bent tube design is suitable for cryogenic, high temperature applications and extremely high pressures.

The new MFC 4000 converter offers high performance with air entrainment, excellent zero stability and advanced density measurement.

Industries:

- Chemical
- Pharmaceutical
- Food
- Oil and gas
- Petrochemical
- Pulp and paper
- Mining and minerals
- Power plants
- Water and wastewater

OPTIMASS 2000 – Minimal installation footprint

The modular product line

	The standard device with an excellent price-performance ratio	The first choice for bulk flows for custody transfer	Suitable for extremely low flow rates
	OPTIMASS 1010	**OPTIMASS 2000**	**OPTIMASS 3010**
Measuring accuracy	Liquid: ±0.15% gas: 0.35 % density: ±2 kg/m³	Liquid: ±0.1% gas: 0.35 % density: ±2 kg/m³ (±0.5 kg/m³)	Liquid: ±0.1% gas: ±0.5% density: ±2 kg/m³ (±0.5 kg/m³)
Communication	Modbus	Modbus	Modbus
Power supply	12 VDC	12 VDC	12 VDC
Protection category	IP67; NEMA4X	IP67; NEMA4X	IP67; NEMA4X
	OPTIMASS 1300	**OPTIMASS 2300**	**OPTIMASS 3300**
	 OPTIMASS 1000 + MFC 300	 OPTIMASS 2000 + MFC 300	 OPTIMASS 3000 + MFC 300
Measuring accuracy	Liquid: ±0.15% gas: 0.35 % density: ±2 kg/m³	Liquid: ±0.1% gas: 0.35 % density: ±2 kg/m³ (±0.5 kg/m³)	Liquid: ±0.1% gas: ±0.5% density: ±2 kg/m³ (±0.5 kg/m³)
Outputs	Current, pulse, status	Current, pulse, status	Current, pulse, status
Inputs	Binary	Binary	Binary
Communication	HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus
Power supply	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC
Protection category: Compact (C) **Field, separate (F)** **Wall (W)** **Rack (R)**	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1
Measuring sensor	**OPTIMASS 1000**	**OPTIMASS 2000**	**OPTIMASS 3000**
	 OPTIMASS 1000	 OPTIMASS 2000	 OPTIMASS 3000
Nominal sizes			
Device, EN 1092-1	DN15...50	DN100...250	DN1...4
Connection EN 1092-1	DN15...100	DN100...300	DN15
Device, ASME B16.5	1/2...2"	4...10"	1/25...4/25"
Connection ASME B16.5	1/2...4"	4...12"	1/2"
Screw-on connector NPT	-	-	1/4" (up to 300 bar; 4351 psi)
Pressure rating EN 1092-1	PN40, 63, 100	PN40, 63, 100, 160	PN40, 63
Pressure rating ASME B16.5	CL 150, 300, 600	CL 150, 300, 600, 900, 1500	CL 150, 300, 600
Secondary pressure containment	100 bar; 1450 psi	40 bar; 580 psi (opt. 150 bar; 2175 psi)	30 bar; 435 psi
Process temperature	-40...+130°C; -40...+266°F	-40...+130°C; -49...+266°F	-40...150°C; -40...+300°F
Ambient temperature	-40...+65°C; -40...+149°F	-40...+65°C; -40...+149°F	-40...65°C; -40...+149°F
Sensor materials	Duplex stainless steel	Duplex steel, super duplex steel	Stainless steel, Hastelloy® C22
Protection category sensor	IP67; NEMA4X	IP67; NEMA4X	IP67; NEMA4X
Ex-Approvals	ATEX, FM, CSA, NEPSI	ATEX, FM, CSA, NEPSI	ATEX, FM, CSA, NEPSI
Hygiene	3A, ASME Bioprocessing	3A, ASME Bioprocessing	-
Custody transfer	-	PTB, NMI, NTEP, MID 2004/22/EC	-
Medium			
Water	x	x	x
Other liquids	x	x	x
Slurries	x	x	-
Gases	x	x	x

The specialists

The standard high-performance meter for the process industry	High-end solution featuring a straight single measuring tube	Specially designed for linear and rotating filling machines	Specially designed for CNG and LPG in dispensing systems
	OPTIMASS 7010	**OPTIBATCH 4011**	**OPTIGAS 4010/5010**
-	Liquid: ±0.1% gas: 0.35% density: ±2 kg/m³ (±0.5 kg/m³)	Liquid: mass: ±0.15% volume: ±0.2%	Liquid: ±0.5% per batch gas: ±0.5% per batch
-	Modbus	Modbus (configuration)	Modbus
-	12 VDC	24 VDC	12 VDC
-	IP67; NEMA4X	IP67; NEMA6	IP67; NEMA4X
OPTIMASS 6400	**OPTIMASS 7300**	**OPTIBATCH 4011**	
 OPTIMASS 6000 + MFC 400	 OPTIMASS 7000 + MFC 300		
Liquid: ±0.1% gas: 0.35% density: ±1 kg/m³ (±0.2 kg/m³)	Liquid: ±0.1% gas: 0.35% density: ±2 kg/m³ (±0.5 kg/m³)	Liquid: mass: ±0.15% volume: ±0.2%	-
Current, pulse, status	Current, pulse, status	Pulse	-
Binary	Binary	-	-
HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus	Modbus (configuration)	-
85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	85...250 VAC; 11...31 VDC; 20.5...26 VAC/DC	24 VDC	-
IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP67; NEMA6 - - -	-
OPTIMASS 6000	**OPTIMASS 7000**	**OPTIBATCH 4000**	**OPTIGAS 4000/5000**
 OPTIMASS 6000	 OPTIMASS 7000		
DN8...250	DN6...80	DN08...15	DN15, 25
DN10...300	DN10...100	-	-
1/2...10"	1/4...3"	-	1/2", 1"
1/2...12"	1/2...4"	-	-
-	-	-	3/4", 1"
PN40, 63, 100, 160	PN40, 63, 100	Process pressure: 10 bar; 145 psi	Process pressure: 350 bar; 5076 psi static, 300 bar; 4351 psi cyclical
CL 150, 300, 600, 900, 1500	CL 150, 300, 600		
-	100 bar	-	-
-200...+400 °C; -328...+752 °F	-40...+150°C; -40...+302°F	0...+100°C; 32...+212°F	-40...+93°C; -40...+200°F
-40...+65°C; -40...+149°F	-40...+65°C; -40...+149°F	-40...+55°C; -40...+131°F	-40...+55°C; -40...+131°F
Stainless steel , Hastelloy C22, duplex steel	Stainless steel, Hastelloy® C22, titanium, tantalum	Stainless steel	Stainless steel
IP67; NEMA4X	IP67; NEMA4X	IP67; NEMA4X	IP67; NEMA4X
ATEX, FM, CSA, NEPSI	ATEX, FM, CSA, NEPSI	-	ATEX, FM, CSA, NEPSI
cFMus, NEPSI	EHEDG, 3A, ASME Bioprocessing	3A, ASME Bioprocessing, EHEDG	-
MID 2004/22/EC, OIML (pending)	PTB, NMI, NTEP, MID 2004/22/EC	-	PTB, OIML R139, NEPSI
x	x	x	-
x	x	x	x (LPG)
x	x	-	-
x	x	-	x

OPTISWIRL 4070 C flange
The universal device with standard integrated temperature compensation for saturated steam and optionally pressure compensation for super-heated steam, gases, wet gases

OPTISWIRL 4070 C sandwich
The first vortex flowmeter with integrated pressure and temperature compensation

Stainless steel centering rings for easy mounting

OPTISWIRL 4070 F flange/
OPTISWIRL 4070 F sandwich
Remote version with field housing
converter with connecting
cable up to 15 m/49 ft

OPTISWIRL 4070 Dual version
With two independent measuring
sensors and two signal converters
for redundent measurement and
increased safety demands

Vortex flowmeters

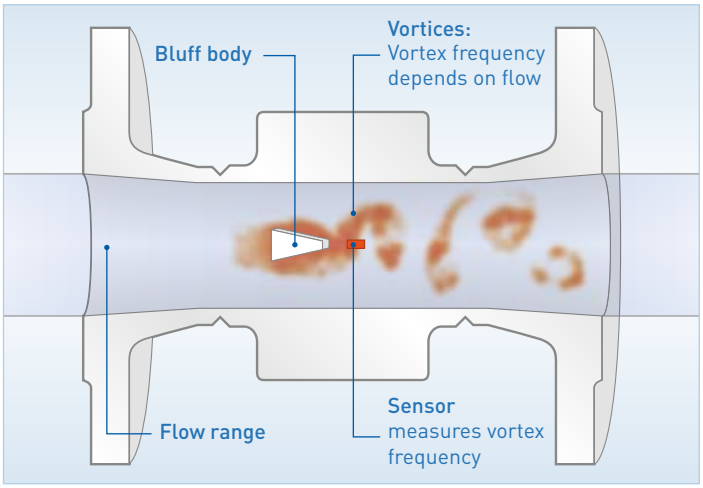
Highlights:

- Integrated pressure and temperature compensation
- Temperature compensation for saturated steam is a standard feature
- All devices feature 2-wire technology
- Excellent long-term stability thanks to sturdy construction
- High measuring accuracy
- Maintenance-free sensor
- Non-wearing, fully-welded stainless steel construction with high resistance to corrosion, pressure and temperature
- Intelligent Signal Processing (ISP) ensures maximum measurement reliability and stability
- Instantly ready for operation (plug & play)

Vortex flowmeters

The measuring principle

The function of vortex flowmeters is based on the principle of the Karman vortex street. Opposing vortices form behind an object in a stream. The measuring tube contains a bluff body, behind which vortex shedding occurs. The frequency of the vortex shedding is proportional to the flow rate. The shedded vortices are picked up and counted as pressure surges by a piezo crystal in the sensor.



Allrounder with integrated pressure and temperature compensation

Vortex flowmeters are suitable for a wide range of media. This is particularly true of the KROHNE OPTISWIRL: It measures both conducting and non-conducting liquids as well as all industrial gases. It also measures saturated steam and superheated steam, compressed air and nitrogen, liquefied gas and flue gas, demineralized water and boiler feed water, solvents and heat transfer oil.

The OPTISWIRL 4070 even masters fluctuating pressures and temperatures thanks to integrated pressure and temperature compensation.

And to ensure a high degree of certainty and measuring stabilityin all these applications, each vortex flowmeter is equipped at the factory with a technology exclusively available at KROHNE: Intelligent Signal Processing – or ISP for short – eliminates external interference, thus guaranteeing a safe and exact analysis.

Industries:

- Chemical
- Metal
- Power plants
- Oil and gas
- Petrochemical
- Pulp and paper
- Food and beverage
- Water and wastewater

	The universal device with standard integrated temperature compensation for saturated steam and optionally pressure compensation for superheated steam, gases, wet gases	The first vortex flowmeter with integrated pressure and temperature compensation
	OPTISWIRL 4070 C/F flange	OPTISWIRL 4070 C/F sandwich
		
Signal converter	VFC 070 C/F	VFC 070 C/F
Measuring accuracy	Re > 20000 ±0.75% for liquids Re > 20000 ±1% for gases and steam 10000 < Re < 20000 ±2% for liquids, gases and steam	Re > 20000 ±0.75% for liquids Re > 20000 ±1% for gases and steam 10000 < Re < 20000 ±2% for liquids, gases and steam
Repeatability	±0.1%	±0.1%
Product temperature	-40...+240°C; -40...+464°F	-40...+240°C; -40...+464°F
Outputs	mA, pulse	mA, pulse
Communication	HART®	HART®
Power supply (Non Ex)	14...30 VDC	14...30 VDC
Power supply (Ex)	14...36 VDC	14...36 VDC
Protection category	IP66, 67	IP66, 67
Measuring sensor	OPTISWIRL 4000 flange	OPTISWIRL 4000 sandwich
Process connection		
EN 1092-1	DN15...300; PN16, 25, 40, 63, 100	DN15...100; PN16, 25, 40, 63, 100
ASME B16.5	1/2...12"; CL 150, 300, 600	1/2...4"; CL 150, 300, 600
Temperature range		
Process	-40...+240°C; -40...+464°F	-40...+240°C; -40...+464°F
Ambient (Non Ex)	-40...+85°C; -40...+185°F	-40...+85°C; -40...+185°F
Ambient (Ex)	-40...+65°C; -40...+149°F	-40...+65°C; -40...+149°F
Materials		
Measuring sensor	1.4404/316L, Hastelloy® C22	1.4404/316L, Hastelloy® C22
Electronics housing	Aluminum	Aluminum
Sensor seal	1.4435/316L, Hastelloy® C276	1.4435/316L, Hastelloy® C276
Protection category		
Measuring sensor	IP66, 67	IP66, 67
Approvals		
Ex	ATEX II 2G Ex d ia [ia] IIC T6, ATEX II 3G EEx nA T4, FM Class I Div 1	ATEX II 2G Ex d ia [ia] IIC T6 , ATEX II 3G EEx nA T4, FM Class I Div 1

	With two independent measuring sensors and two signal converters for twofold functional reliability and availability
	OPTISWIRL 4070 Dual version
	
Signal converter	**VFC 070**
Measuring accuracy	Re > 20000 ±0.75% for liquids Re > 20000 ±1% for gases and steam 10000 < Re < 20000 ±2% for liquids, gases and steam
Repeatability	±0.1%
Product temperature	-40...+240°C; -40...+464°F
Outputs	mA, pulse
Communication	HART®
Power supply (Non Ex)	14...30 VDC
Power supply (Ex)	14...36 VDC
Protection category	IP66, 67
Measuring sensor	**OPTISWIRL 4000**
Process connection	
EN 1092-1	DN25...100; PN16, 25, 40, 63, 100
ASME B16.5	1...4"; CL 150, 300, 600
Temperature range	
Process	-40...+240°C; -40...+464°F
Ambient (Non Ex)	-40...+85°C; -40...+185°F
Ambient (Ex)	-40...+65°C; -40...+149°F
Materials	
Measuring sensor	1.4404/316L, Hastelloy® C22
Electronics housing	Aluminum
Sensor sea	1.4435/316L, Hastelloy® C276
Protection category	
Measuring sensor	IP66, 67
Ex	ATEX II 2G Ex d ia [ia] IIC T6 , ATEX II 3G EEx nA T4, FM Class I Div 1

Measuring principle: Deflector plate

DW 181
With screw-in thread

DW 182
With flanged connection, DN15...65

DW 183
With flanged connection, DN65...200

DW 184
Insertion version, ≥DN250

Measuring principle: Electromagnetic

DWM 1000
Monitoring unit with binary output

DWM 2000
Flowmeter with
4...20 mA output

Flow controllers

Highlights DWM 1000, 2000:

- Measurement and monitoring of electrically conductive liquids, pastes and suspensions
- Process temperature: -25 °C...+150 °C; -13...+302 °F
- Operating pressure: 25 bar; 363 psi
- Sturdy construction
- No moving parts, maintenance-free
- Parts in contact with media made of stainless steel and ceramic
- Electronic unit can be replaced while under operating conditions
- For pipelines ≥DN25; 1"

Electromagnetic switches and flowmeters

The measuring principle

As early as 1832, Faraday tried to determine the speed of the current in the Thames by measuring the voltage induced in flowing water by the earth's magnetic field. Electromagnetic flow measurement is based on Faraday's Law of induction. According to this law, a specific voltage is induced in a conductor or conductive medium that moves through a magnetic field. This voltage is proportional to the speed of movement of the medium.

On electromagnetic flowmeters, the induced voltage is tapped via two measuring electrodes in conducting contact with the medium.

An electronic converter converts the signal into a proportional output signal.

Sturdy and maintenance-free: Flow switch DWM 1000 and flowmeter DWM 2000

Industries:

- Water and wastewater
- Food and beverage
- Chemical
- Pharmaceutical
- Process industry
- Pulp and paper
- Mining and minerals
- Steel

As the inventor and founder of the industrially used electromagnetic flow technology, we have been impressing our customers with exemplary innovation for over 45 years.

With the DWM 1000 and DWM 2000 flow controllers, KROHNE offers its customers two sturdy units.

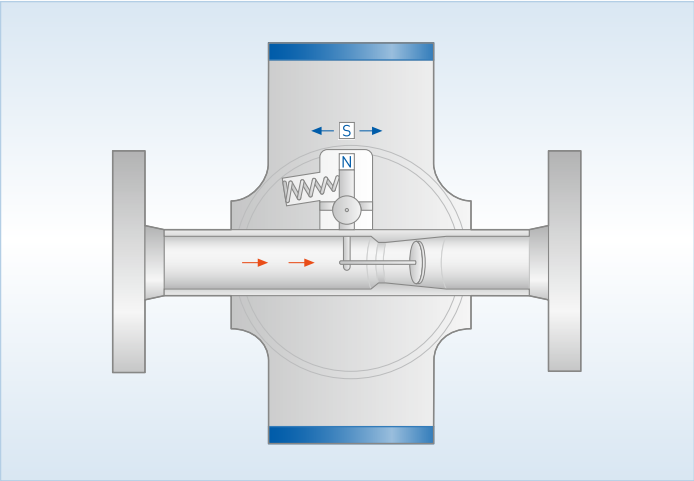
Depending on the design, the flow speed is monitored (DWM 1000) or measured and output via a 4...20 mA (DWM 2000).

The only prerequisite is that the electrical conductivity of the medium be at least 20 µS/cm. DWM 1000 and DWM 2000 switch and flowmeters are ideal for use with largely homogenous liquids, pastes and sludges – even with solid content.

Flow controllers

The measuring principle

With the flow controllers DW 181 to 184, the fluid flows against a springmounted baffle. The position of the baffle changes with increasing flow. A built-in magnet transmits the position to the display and also activates the limit switch.



Always the right choice: Flow controllers DW 181, 182, 183, and 184

With the flow controllers DW 181, 182, 183 and 184, KROHNE offers the ideal flow control solution for virtually any process connection.

Each device is equipped with a limit switch (dry reed contact) and it is possible to install another switch at any time. For greater switching energies of up to 1200 VA, an additional amplifying relay can be installed.

Maximum freedom, even when it comes to the right display: For the DW 181 to 184 versions, there are two different choices available with the G and A displays.

The G display enables visual monitoring of the flow via a 10-point scale. The switching point can be changed at any point along the way. The A display allows a more accurate reading of the flow value (e.g. in l/h or in m^3/h) via a scale. With this display, the switching points can be set even when there is no flow.

Industries:

- Power plants
- Steel
- Mining
- Petrochemical
- Oil and gas
- Chemical
- Food and beverage
- Water and wastewater

Highlights DW 181 to DW 184:

- One or two electric limit switches
- For horizontal or vertical pipelines (DW 181 to 183)
- Mounting type for horizontal pipelines (DW 184)
- Depending on design, available with screw-type, flange or mounting flange connectors
- Two different flow displays (G and A) to choose from (DW 181 to183)
- High-temperature design up to max. +300 °C; +572 °F
- Ex- version (EEx d)
- Tropical version with Amphenol sockets and a double coating of epoxy on device
- Local indication without power supply, can be used as variable area flowmeter

Flow controllers and flowmeters

	Flow controllers based on baffle measuring principle	Flow controller based on electromagnetic measuring principle
	DW 181 to184	DWM 1000
		
Measuring accuracy	±15% of switching point	When v >1 m/s or 3.3 ft/s: accuracy ±5% of switching point when v <1 m/s or 3.3 ft/s: accuracy ±2% of switching point , ±3 cm/s / ±1.2 in/s
Repeatability	±3% of switching point	±1% of switching point
Limit switches	1 or 2 binary outputs; 1 or 2 relay outputs	1 binary output
Output	-	-
Communication	-	-
Power supply	Switching voltage AC: 24, 48, 110, 240 VAC; switching voltage DC: 24, 48, 110 VDC	48...240 VAC; 48VDC; relay voltage: 48, 110, 240 VAC; 48 VDC
Protection category	Standard: IP55 high temperature: IP44 EEx d: IP65	IP66, 68; NEMA4, 4X, 6P
Nominal size		
Pipe diameter	≥DN15; 1/2"	≥DN25; 1"
Connection	3/4...2" NPT; G3/4...2 DN15...200; 1/2...8"	Std fitting G1A; screw-on welding socket (Ø39 mm; Ø1.25") long sensor (option) 1 1/2" NPT; G1 1/2 screw-on welding socket (Ø60 mm; Ø2.4"); spool piece (option) DN25...50; 1...2", DN32; 1 1/4" on request; FT Tuchenhagen (option) VARIVENT® connection
Pressure ratings		
Max. operating pressure	100 bar; 1450 psi; more on request	25 bar; 360 psi
Process conditions		
Medium	Homogeneous, clean liquids	Conductive liquids, pastes, slurries ≥20 mS/cm
Viscosity standard	≤30 mPas; 0.02 lb/fts	-
Viscosity special version	≤250 mPas; 0.16 lb/fts	-
Measuring range	0.2...4 m/s; 0.66...13.12 ft/s	0.1...9.9 m/s; 0.3...32.5 ft/s
Temperature ranges		
Process	-40...+150°C; -40...+300°F -25...+300°C; -15...+570°F (high temperature)	-25...+150°C; -13...+300°F -25...+60°C; -13...+140°F (IP68)
Ambient	-40...+80°C; -40...+175°F -25...+60°C; -13...+140°F (high temperature)	-25...+60°C; -13...+140°F
Materials		
Measuring tube	Bronze, stainless steel, steel	Stainless steel, zirconium
Measuring system	Stainless steel	Electrode: platinum
Approvals		
Ex	EEx ia, EEx d	-

	Flowmeter based on electromagnetic measuring principle
	DWM 2000
	
Measuring accuracy	When v >1 m/s or 3.3 ft/s: accuracy ±5% of measured value (±2% if calibrated onsite) when v <1 m/s or 3.3 ft/s: accuracy ±2% of measured value, ±3 cm/s / ±1.2 in/s
Repeatability	±1.5% of measured value
Limit switches	-
Output	4...20 mA, 3-wire
Communication	RS232
Power supply	12, 24 VDC, 50 mA
Protection category	IP55, 68; NEMA4, 4X, 6P
Nominal size	
Pipe diameter	≥DN25; 1"
Connection	Std fitting G1A, screw-on welding socket (Ø39 mm; Ø1.25") long sensor (option) 1 1/2" NPT; G 1 1/2, screw-on welding socket (Ø60 mm; Ø2.4") spool piece (option) DN25...50; 1...2", DN32; 1 1/4" on request FT Tuchenhagen (option) VARIVENT® connection
Pressure ratings	
Max. operating pressure	25 bar; 360 psi
Process conditions	
Medium	Conductive liquids, pastes, slurries ≥20 mS/cm
Viscosity standard	-
Viscosity special version	-
Measuring range	1...8 m/s; 3.3...26.2 ft/s
Temperature ranges	
Process	-25...+150°C; -13...+300°F -25...+60°C; -13...+140°F (IP68)
Ambient	-25...+60°C; -13...+140°F
Materials	
Measuring tube	Stainless steel, zirconium
Measuring system	Electrode: platinum
Approvals	
Ex	-

Open for the future

Beyond the highest requirements: KROHNE services

For us, service starts at our first contact with you and lasts as long as the life of our systems installed at your plant.

Quality and reliability are key to maintaining the highest service standards. All KROHNE Feeder Factories are ISO 9001 certified. In fact, long before ISO 9000 existed, KROHNE was manufacturing to the highest industrial standards. Now certification exists in every factory to demonstrate that we not only fulfil ISO requirements but have passed the ISO certification procedure every three years since the standard was introduced.

If you install and operate any KROHNE product by following our operating instructions correctly, problems shouldn't occur. If they do, we will provide you with all the technical support and service you need.

Choose from maintenance and service contracts tailored to suit all business sizes and needs: Spare parts and consumables, field service and on-site repair, returns, workshop repair, helpdesk.

KROHNE Academy

The KROHNE Academy is a series of seminars organised in collaboration with leading automation companies aimed at plant engineers, operators and contractors across the process industries. It brings industry experts together to provide an insight into the various technologies, industrial standards and procedures that plant operators can find themselves faced with.

Taking place in various countries, KROHNE Academy seminars address key operating issues, from plant safety to ways of increasing plant efficiency and controlling costs, and show possible solutions. They also provide an ideal opportunity for you to speak to the experts and benefit from their vast application knowledge.

Learn more about KROHNE Academy at **www.krohne.com**

Engineering services through all project stages

- Project management
- Control and asset management systems in project concept phase
- Basic engineering based on the specification required by the user
- Detail engineering phase
- Commissioning services
- On-site start-up and commissioning
- Product training (on-site)
- Calibration services

Additional online services:

(Find them at **www.krohne.com**)

- **KROVASYS 4**
  Selection and calculation tool for variable area flowmeters.
- **Planning tool for water & wastewater industry**
  The planning tool for wastewater treatment plants as well as water and wastewater applications for generating tender documents covering flow, level, analysis, pressure and temperature.
- **PiCK**
  Get any information related to your KROHNE product from our dedicated online resource PiCK. Just enter your serial number, and key material like manuals, Quick Starts and calibration documents is at your fingertips.

Communication at KROHNE: Open for the future

Industrial automation in the process industry has been undergoing rapid change for the past twenty years. This has also affected industrial measurement technology. Where it was once centralised and largely self-contained structures that dominated, today the pace is set by intelligent, decentralised architectures.

Thus, system concepts in which the products of a variety of manufacturers work harmoniously together are becoming a reality via open, standard interfaces such as HART®, PROFIBUS® and FOUNDATION™ fieldbus.

KROHNE has been actively following this development for years. Whether we are talking about flow measurement, level measurement, temperature measurement or analytical measuring technology.

PACTware™ is a manufacturer-independent tool based on FDT technology, providing device configuration and operation. It is free of charge. DTMs are drivers for FDT-based systems. KROHNE DTMs are available free of charge, without licence and without any functional restrictions. PACTware™ and DTMs come along with the devices on a CD and can also be downloaded from the KROHNE download center.

Integration is a top priority at KROHNE

KROHNE is committed to making communication convenient. Which is why our field devices communicate reliably with controllers, process control systems (PLC/DCS) and standalone PCs. They meet all of the prerequisites for integration into modern plant asset management systems, based on integration technologies such as DD/EDD and FDT/DTM. We are a longstanding member of PACTwareTM and the FDT Group®. Since 2003, we have made DTMs available for our field devices with HART®, PROFIBUS® or FOUNDATION™ fieldbus interfaces.

Configure It:
The online platform for everyone

For as long as KROHNE has been in business, our engineers and application technicians have been working hard on the development and testing of groundbreaking technologies.

The result: innovations that greatly exceed statutory requirements. Innovations that give the market a decisive push forwards.

With the Configure It – a highly advanced online configuration tool – our customers can tap into these innovations even more easily, faster and more conveniently – 7 days a week, 365 days a year, 24 hours a day.

Maximum functionality and ease of use

Configure It combines maximum functionality with extraordinary ease of use. This is made possible by the intuitive user interface and the very clear structure of navigation within the program.

The result? With Configure It you can configure in just a few steps exactly the product that is optimally suited for your application and get free 2D/3D CAD data. Try it for yourself!

By the way: Not only can you order most of our products via Configure It, you can also obtain replacement parts and complete systems.

For more information about Configure It, go to **www.krohne-direct.com**

Calibration from KROHNE: Certainty you can count on

The true quality of a flowmeter becomes apparent when conditions are less than favourable: e.g. extreme fluctuating pressures, vacuum surges, measuring inhomogeneous media or media with a high proportion of solids.

That is why we at KROHNE do everything, starting with the calibration, to ensure that our flowmeters perform impressively, with the highest degree of accuracy, reliability and reproducibility, even under such conditions.

We operate more than 120 calibration facilities for volume flow, mass flow, level, temperature, density and pressure to (wet-)calibrate any devicewe manufacture.

For example, every flowmeter is wet-calibrated using water or air as standard before leaving our facilities.

For calibration we only use direct comparison of measurands (e.g. we calibrate our Coriolis mass flowmeters with a gravimetric weighing system). Our calibration rigs are the most accurate used in measuring device production worldwide: the accuracy of the reference is usually 5 to10 times better than that of the meter under test.

Certified technology for fiscal & custody transfer applications. Our meters can be calibrated and certified according to various standards such as OIML, API, Measurement Instruments Directive (MID 001, 002, 004, 005), GOST, etc. The standards we use for calibration are ISO/IEC 17025 accredited and traceable to international or national standards. Regular inspections by national metrology institutes, round robin tests and alignments with national and international metrologicalstandards according to ISO 9000 and EN 45000 guarantee the quality and comparability of our calibration rigs. Staff performing the calibrations aretrained and given regular re-trainings to ensure quality and continuity.

KROHNE proved:
Expect more – achieve more

Every one of our flowmeters is given a thorough inspection before leaving one of our factories in Germany, Great Britain, the Netherlands, France, Brazil, China, India or Russia.

We call these specific measurements, tests and factory inspections "KROHNE proved". They go well beyond any legal requirements, thus guaranteeing our customers not only compliance with specified technical data but also the precise and reliable use of our devices under extremely difficult conditions.

For example, every electronic component undergoes a whole series of comprehensive temperature change tests.

During these tests the components are exposed to cyclical temperature changes of between -20 °C; -4 °F and +60 °C; +140 °F. Breakdowns in the field are thus kept to a minimum.

And we will not budge on these strict tests. After all, we want to be sure that we have a clear picture of the quality and performance capability of the products we offer our customers.

This is the basic principle by which you can measure any device leaving our factory, now and in the future.

KROHNE
Product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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